

FUTON FRAME WITH LOAD BEARING DETENT APPARATUS

BACKGROUND OF THE INVENTION

[0001] This invention relates generally to folding furniture. More specifically, this invention relates to futons that may be selectively positioned to function as a couch and a bed.

BACKGROUND OF THE INVENTION

[0002] Recently, the demand for foldable futons has increased due to the flexibility of use in that these futons may function as either a sofa or a bed. The dual functionality of the foldable futons makes them both cost effective and space saving. Foldable futons abrogate the need to have a separate seat and bed.

[0003] Currently, foldable futon frames are available in a variety of designs. For example, U.S. Patent No. 5,303,432 to Fitts discloses a convertible futon frame that includes opposed end frames interconnected by front and back rails to define a rigid rectangular frame. Seat and back members are movably connected to the rectangular frame and to each other so that an individual can convert the frame between sitting and sleeping positions.

[0004] U.S. Patent No. 5,664,268 to Stoler et al. discloses a convertible futon frame which acts as both couch and bed, that includes two pad support members attached in a pivotal and displaceable fashion wherein the members allow for temporary locking and unlocking of the two pad support members to enable one of the pad support

members to be temporarily used as a lever arm to move the other pad support member from a bed position to a back rest position.

[0005] Convertible frames of the prior art often suffered from slipping of the seat with respect to the back during conversion of the futon from the bed position to the sitting position. This would then result in the need to exert the extra pushing force on the seat to firmly put the seat into a final seating place when the futon is placed in the sitting position.

[0006] What is needed, therefore, is a convertible futon that requires less physical effort to convert between sitting and bed positions.

SUMMARY OF THE INVENTION

[0007] A futon frame features the use of a detent that allows the seat and back platform to be rotated from the bed position to the sitting position at a predetermined angle without the need to exert an extra pushing force on the seat to firmly put the seat into a final seating place. The detent is mounted onto a force spreading mortise plate to make the conversion of the frame from the bed position to the sitting position much less physically demanding than in the comparable convertible frames of the prior art.

[0008] The futon frame also employs the use of a cam and journal system to guide the movement of the seat and the back platforms when converting between sitting and bed positions and to secure the back and the seat platforms in a desired position. The cam and journal system provide the support mechanism to maintain the seat and back platforms

in either position without the aid of any other locking mechanism or support arms.

[0009] In a further embodiment, the cam and journal system may include low friction surfaces that reduces the physical effort required to move between the bed and sitting positions.

BRIEF DESCRIPTION OF THE DRAWINGS

[00010] Fig. 1 is a perspective view of a futon frame in accordance with the present invention;

[00011] Fig. 2 is an exploded perspective view of the futon frame shown in Fig. 1;

[00012] Fig. 3 is a plan view showing the cam and journal system contained within the frame;

[00013] Fig. 4 is a plan view showing the side plank of the back platform;

[00014] Fig. 5 is a plan view showing the side plank of the back platform, rotated 180°;

[00015] Fig. 6 is a plan view showing the side plank of the seat platform;

[00016] Fig. 7 is a plan view showing the complete cam and journal system;

[00017] Fig. 8 is a plan view in which seat and folding platforms, shown in Fig. 1, are placed in an intermediate position to allow the futon frame to function as a seat;

[00018] Fig. 9 is a plan view of a force spreading mortise plate with detent;

[00019] Fig. 10 is a plan view showing the futon frame in the bed position;

[00020] Fig. 11 is a plan view showing the seat platform and the back platform extending from each other in an

unlocked position to initiate the process of converting the bed into a couch;

[00021] Fig. 12 is a plan view showing the seat platform pivoted upward;

[00022] Fig. 13 is a plan view showing the seat platform pivoted upward sufficiently high so as to form a lever type engagement with the bed platform;

[00023] Fig. 14 is a plan view showing the seat platform being used as a lever to move the bed platform; and

[00024] Fig. 15 is a plan view showing the futon frame in the sitting position.

DETAILED DESCRIPTION OF THE INVENTION

[00025] Referring to Figs. 1 and 2, a futon frame 10 includes a first and a second end frame 12 and 13, respectively, and a pair of spaced-apart and parallel cross-members 14 extending along a width-wise direction, W, between the end frames 12 and 13. End frame 12 contains one pair of legs 16a and 16b. End frame 13 contains one pair of legs 16c and 16d. End frames 12 and 13 are identical although mirror images. As such, the same reference numerals apply to the components of both, and only one will be described in detail.

[00026] Futon frame 10 comprises four sides, shown as side 10a, side 10b, side 10c, and side 10d. Side 10a is disposed opposite to side 10c and side 10b is disposed opposite to side 10d. Side 10a and side 10c are disposed transversely to side 10b and side 10d.

[00027] Leg 16a extends from an arm-rest 18, terminating in a foot member 20, and positioned proximate to side 10c. Leg 16b extends from an arm-rest 18, terminating in a foot

member 20, and positioned proximate to side 10a. The legs 16a and 16b of end frame 12 are spaced apart along a depth-wise direction, D, with the depth-wise direction, D, extending transverse to the width-wise direction, W. A support beam 22 is associated with end frame 12 and extends between the legs 16a and 16b, parallel to the depth-wise direction, D.

[00028] Referring to Fig. 3, support beam 22 comprises four sides, three of which are shown as side 22a, side 22b, and side 22c. Side 22b is disposed opposite to side 22c and side 22a extends therebetween. Leg 16a comprises four sides, three of which are shown as side 17a, side 17b and side 17c. Side 17b is disposed opposite to side 17c and side 17a is disposed therebetween.

[00029] Leg 16a comprises a recess disposed on side 17a defining a cam 220. Cam 220 is arcuate in shape and concave with respect to leg 16b. Support beam 22 comprises a recess disposed on side 22a defining a cam 222. Cam 222 has a linear slope and extends obliquely with respect to the horizontal axis h. Cam 222 extends from a region on side 22a proximate to side 22c away from leg 16a and terminates proximate to side 22b. Boundary 30, shown in Fig. 6, comprises a recess defining a cam 224 facing support beam 22. Cam 224 is oval in shape and is disposed proximate to leg 16a.

[00030] Referring to Figs. 3, 4, 5, and 6, journal 200 is disposed within cam 220. Journal 200 is permanently attached to perimeter 44 but is allowed to roll within the recessed surface of cam 220. Journal 202 is disposed within cam 222. Journal 202 is permanently attached to perimeter 44 but is allowed to roll within the recessed surface of

cam 222. Journal 204 is disposed within cam 224. Journal 204 is permanently attached to perimeter 44 but is allowed to roll within the recessed surface of cam 224.

[00031] Cam 220 is lined with a low friction surface to facilitate movement of journal 200. Cam 222 is lined with a low friction surface to facilitate movement of journal 202. Cam 224 is lined with a low friction surface to facilitate movement of journal 204.

[00032] Referring to Fig. 3, cam 220 contains a throughway 230 for ingress and egress of journal 200 within cam 220 for use of assembly and disassembly. Throughway 230 is located proximate to side 17b of leg 16a and extends from cam 220 to side 17b of leg 16a. Cam 222 contains a throughway 232 for ingress and egress of journal 202 within cam 222 for use of initial instillation and setup, as well as disassembly. Throughway 232 is located proximate to side 22b of support beam 22 and extends from cam 222 to side 22b of support beam 22. Fig. 7 shows the complete cam and journal system.

[00033] Referring to Figs. 1 and 2, the seat platform 24 includes a plurality of billets, the ends of which are coupled together, forming a boundary 30 enclosing a region 32, and a plurality of slats 34. Although the boundary 30 may be of any shape desired, it is preferred that boundary 30 have a rectangular region. To that end, the seat platform 24 includes four billets 36a, 36b, 36c and 36d, each of which includes opposed tip portions 38a, 38b, 38c and 38d, respectively. Billets 36a and 36c are spaced-apart and extend parallel to each other, with billets 36b and 36d extending transverse thereto. Billets 36b and 36d are spaced-apart and extend parallel to each other. The slats

34 extend between billets 36b and 36d. In this fashion, one of the opposed tip portions 38a of billet 36a is attached, using fasteners 45, to a tip portion 38b of billet 36b, defining a union 40a. Although any type of fasteners may be employed, typically, fasteners 45 are wood screws. The remaining tip portion 38a of billet 36a is attached, using fasteners 45, to a tip portion 38d of billet 36d, defining a union 40d. The tip portion 38b, disposed opposite to billet 36a, is attached, using fasteners 45, to one of the opposed tip portions 38c of billet 36c, defining a union 40b. The remaining tip portion 38c of billet 36c is attached, using fasteners 45, to one of the opposed tip portions 38d, disposed opposite to billet 36a, of billet 36d, defining a union 40c.

[00034] The back platform 26 includes a plurality of planks, which are attached together in a fashion similar to the billets, 36a-36d of the seat platform 24, discussed above. Specifically, the ends of the planks are coupled together, forming a perimeter 44 enclosing an area 46, and a plurality of panel-boards 48. Although the area 46 may be of any shape desired, it is preferred that area 46 have a rectangular shape. To that end, the seat platform 24 includes four planks 50a, 50b, 50c and 50d, each of which includes opposed tip portions 52a, 52b, 52c and 52d, respectively. Planks 50a and 50c are spaced-apart and extend parallel to each other, with planks 50b and 50d extending transverse thereto. Planks 50b and 50d are spaced-apart and extend parallel to each other, with the panel-boards 48 extending therebetween. In this fashion, one of the opposed tip portions 52a of plank 50a is attached, using fasteners 45, to a tip portion 52b of plank

50b, defining a junction 54a. The remaining tip portion 52a of plank 50a is attached, using fasteners 45, to a tip portion 52d of plank 50d, defining a junction 54d. The tip portion 52b, disposed opposite to plank 50a, is attached, using fasteners 45, to one of the opposed tip portions 52c of plank 50c, defining a junction 54b. The remaining tip portion 52c of plank 50c is attached, using fasteners 45, to one of the opposed tip portions 52d, disposed opposite to plank 50a, of plank 50d, defining a junction 54c.

[00035] Referring to Figs. 1, 2, and 8, in the fully open position, seat and back platforms 24 and 26 lie in a common plane, with the angle therebetween, θ , measuring 180° . The back platform 26 rests against one of the pairs of cross-members 14, and the seat platform 24 lies against the remaining cross-member 14.

[00036] Referring to Figs. 1, 2 and 9, a force spreading mortise plate 250 is attached to futon frame 10 at desired locations to enhance the durability and functionality of futon frame 10. For example, U.S. Patent No. 6,108,833 to Grossman et al. discloses the use and placement of a force spreading mortise plate. The force spreading mortise plate 250 located on perimeter 44 contains a detent 252 used to help the user convert the futon frame 10 from the bed position to the sitting position. Detent 250 allows for rotation of the seat platform 24 coupled to back platform 26 when changing the futon from the bed position to the sitting position at a predetermined angle without the slipping of seat platform 24 with respect to back platform 26. This slipping of seat platform 24 will cause seat platform 24 to extend past cross-member 14 when the futon is placed in the sitting position more than what is

designed for. This will then necessitate the need to exert an extra pushing force to seat platform 24 to place seat platform 24 in the properly designed position when the futon is placed in the sitting position. Detent 252 allows for the absence of the need to exert an extra pushing force onto seat platform 24 to firmly put seat platform 24 into place.

[00037] Referring to Fig. 10, when futon frame 10, shown in Fig. 1, is disposed in the bed position, seat platform 24 and back platform 26 are placed horizontally next to each other with respect to the horizontal axis. Journal 200 is placed at the bottom of cam 220. As a result of the fixed space relation of journal 200 with respect to journal 202, journal 202 is placed at the front of cam 222. For optimum comfort, seat platform 24 and back platform 26 should be placed touching next to each other. As a result of this, journal 204 is placed at the front of cam 224.

[00038] Referring to Fig. 11, when converting from the bed position to the seating position, a pulling force must be applied to the seat platform 24 to cause separation of seat platform 24 from back platform 26. This will in turn cause journal 204 to be moved to the back of cam 224.

Referring to Fig. 12, an upward force then must be applied to seat platform 24 to lift it in the air about the axis as determined from the placement of journal 204 within cam 224. Referring to Fig. 13, once seat platform 24 has been lifted in the air sufficiently high enough, seat platform 24 must be given a pushing force to cause seat platform 24 to be properly disposed underneath detent 252 located on the force spreading mortise plate 250, which is in turn, located on back platform 26. Referring to Fig. 14, after

proper placement of seat platform 24 underneath back platform 26 and contact of seat platform 24 with detent 252, a downward force must be applied to seat platform 24 causing seat platform 24 and back platform 26 to be positioned in the seating position.

[00039] Referring to Fig. 15, when futon frame 10, shown in Fig. 1, is positioned in the seating position, seat platform 24 and back platform 26 are positioned at a predefined angle therebetween, θ , to each other. Journal 200 is placed at the top of cam 220. As a result of the fixed space relation of journal 200 with respect to journal 202, journal 202 is placed at the back of cam 222. For locking of seat platform 24 and back platform 26, journal 204 is placed at the front of cam 224.

[00040] If conversion of the futon frame 10 from the sitting position to the bed position is desired, a lifting force must be applied to seat platform 24 to cause rotation of seat platform in conjunction with back platform 26, until back platform 26 is in the horizontal position. A pulling force must be applied to seat platform 24 to cause disengagement of seat platform 24 from back platform 26. Seat platform 24 then can be rotated downward until seat platform 24 is in the horizontal position. A pushing force must then be applied to seat platform 24 to cause seat platform 24 to be placed horizontally next to back platform 26 for optimum comfort.

[00041] To summarize, when futon frame 10 is positioned in the bed position, journal 200 is positioned at the bottom of cam 220, journal 202 is positioned at the front of cam 222 and journal 204 is positioned at the front of cam 224. When futon frame 10 is positioned in the seating

position, journal 200 is positioned at the top of cam 220, journal 202 is positioned at the back of cam 222 and journal 204 is positioned at the front of cam 224.

[00042] While this invention has been described with references to various illustrative embodiments, the description is not intended to be construed in a limiting sense. Various modifications and combinations of the illustrative embodiments, as well as other embodiments of the invention, will be apparent to persons skilled in the art upon reference to the description. It is, therefore, intended that the appended claims encompass any such modifications or embodiments.